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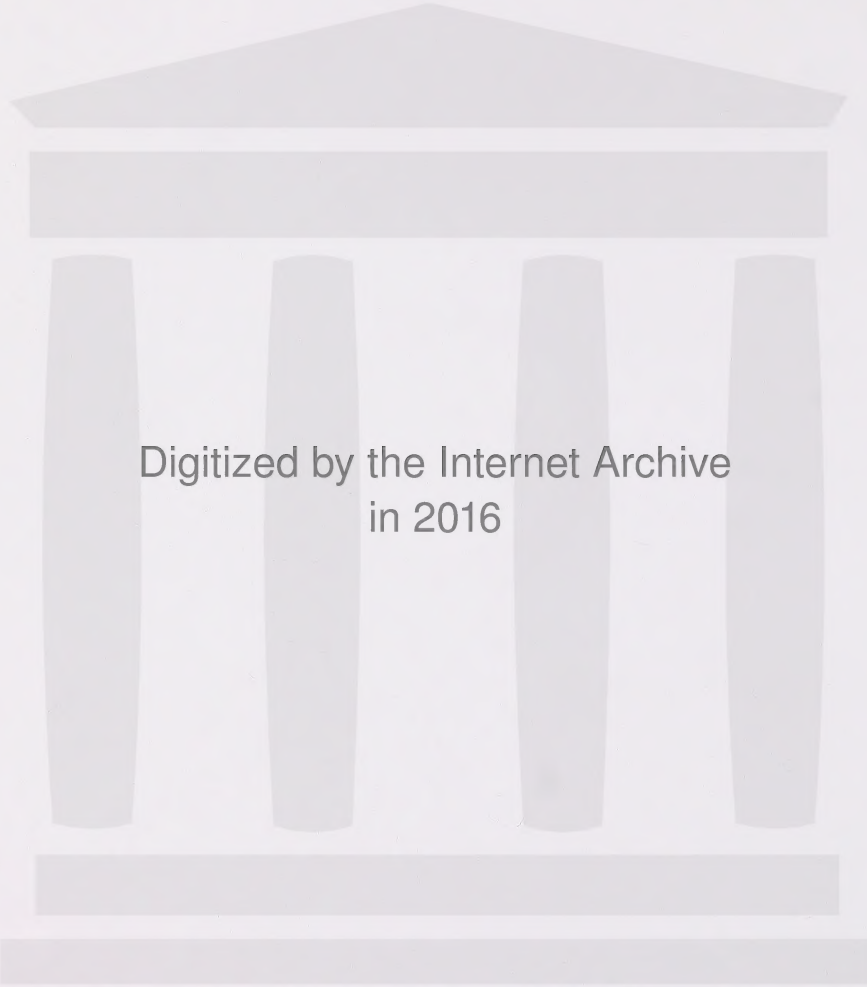
Distribution and Population Trends of the Canadian Toad (*Anaxyrus hemiophrys*) in Alberta



Alberta Species at Risk Report No. 126

March 2009

Alberta



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Distribution and Population Trends of the Canadian Toad (*Anaxyrus hemiophrys*) in Alberta

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Alberta Sustainable Resource Development (SRD)

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EXECUTIVE SUMMARY

It has been 10 years since the status report for the Canadian toad (*Anaxyrus hemiophrys*, formerly *Bufo hemiophrys*) has been written (Hamilton et al. 1998). Unfortunately, in the intervening years, surprisingly little has been done to determine: the threats to this species, essential habitat requirements, aspects of its biology, changes in population size and/or the distribution of populations, which areas of the province populations are most vulnerable, or steps necessary to prevent further declines.

My objectives were to collect and collate all available data on Canadian toads and conduct a preliminary assessment of the trends in distribution and population size for the Canadian toad in Alberta. Alberta Fish and Wildlife's Fish and Wildlife Management Information System (FWMIS) data and data submitted by a number of other individuals/organizations provided the source for this compilation.

Canadian toads have been observed from 52 of the 76 counties/land regions in Alberta (Table 1). Of the 52 regions in which Canadian toads have been observed, they have not been observed in 25 (48 %) of these regions in the past 10 years. Canadian toads are often observed in the Municipality of Wood Buffalo, Lakeland County, Municipal District of Bonnyville, and the Municipal District of Wainwright, but are rare (1-5 observations from 1998-2007) in the other 23 regions where they occur.

The absence of observations in some areas may be simply because no one has looked for Canadian toads (e.g., Flagstaff County). However, extensive surveys have been conducted in areas where Canadian toads were historically present with no observations resulting (e.g., Elk Island National Park, City of Edmonton, Strathcona County, Red Deer River area), suggesting that declines in distribution have occurred. Canadian toads are still widespread, but the number of populations seems to have decreased in the Parkland and Grasslands regions of Alberta despite an increase in survey effort (Figure 2 a and b).

The lack of province-wide, standardized surveys makes it difficult to assess the status of Canadian toad in Alberta. However, comparing the proportion of Canadian toad observations reported from 1998-2007 versus 1988-1997, to observations of other anuran species (wood frogs, *Lithobates sylvaticus*, chorus frogs, *Pseudacris maculata*, and western toads, *Anaxyrus boreas*) suggests a decline has occurred (Table 2).

One of the factors limiting our understanding of where Canadian toads have experienced distribution declines is the failure to report zero data. For many areas of the province, we can not determine if the absence of Canadian toad points is due to population declines or to the absence of observers, because most people have not reported areas where they searched for amphibians but did not find any. Our understanding could be greatly improved if more individuals submitted observations of common species (e.g., wood frogs and chorus frogs) and data from all areas that were surveyed for amphibians, regardless of results.

ACKNOWLEDGEMENTS

This report would not have been possible without the help of the many individuals who submitted data on Canadian toad observations and/or areas they have searched for but not found toads. I would like to thank all of the volunteers of the Alberta Volunteer Amphibian Monitoring Program, individuals who submitted data to Alberta Fish and Wildlife for their Fish and Wildlife Management Information System (FWMIS), and individuals/organizations who submitted data specifically for this report, including the American Museum of Natural History, Amber Ashenhurst (Ouzel Environmental Consulting), Corey De La Mare (Golder Associates Ltd.), Justin Hanisch and Leah McGraw (both of University of Alberta), Rick Lauzon (Komex International), Joe Litke (Fiera Biological Consulting Ltd.), Shane Mascarin (DND Base Wainwright), Zachary Otke (Ryerson University), Mark Steinhilber (Royal Alberta Museum), Ross MacCulloch (Royal Ontario Museum), and Anthony Russell (University of Calgary).

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TABLE OF CONTENTS

Executive Summary.....	2
Acknowledgements.....	3
Introduction and Methods.....	5
Distributional Trends.....	7
Detailed Trends by Region.....	10
Grasslands Natural Region.....	10
Parkland Natural Region.....	13
Boreal Forest Natural Region.....	20
Foothills Natural Region.....	26
Rocky Mountain Natural Region.....	27
Recommendations.....	28
References.....	29
Tables.....	31
Figure Captions.....	34

INTRODUCTION AND METHODS

The Canadian toad (*Anaxyrus hemiophrys*, formerly *Bufo hemiophrys*, see Frost et al. 2006) is ranked as May Be at Risk in Alberta; however its legal status is Data Deficient (ASRD 2002). It has been 10 years since the status report for the Canadian toad has been written (Hamilton et al. 1998). Unfortunately, in the intervening years, surprisingly little has been done to fill this data gap and determine threats to this species, essential habitat requirements (except Garcia et al. 2004), aspects of its biology (except Bursey and Goldberg 1998; Eaton et al. 1999, 2005; Taylor et al. 1999a,b; Pauly et al. 2004), changes in population size and/or the distribution of populations, increasing, or stable (except Browne et al. 2003; Wilkinson and Berg 2004), which areas of the province populations are most vulnerable, or steps necessary to prevent further declines.

Despite the lack of active research on this species, some progress has been made. The Alberta Conservation Association's Volunteer Amphibian Monitoring Program (AVAMP) has collected hundreds of observations for this species from volunteers and has added them to Alberta Fish and Wildlife's Fish and Wildlife Management Information System (FWMIS).

My objectives were to collect and collate all available data on Canadian toads (including surveys in Canadian toad range that did not yield any observations) and conduct a preliminary assessment of the trends in distribution and population size for the Canadian toad in Alberta. Alberta Fish and Wildlife's FWMIS data and data submitted by a number of other individuals/organizations provided the source for this compilation.

In this report, I've focused on comparisons between observations that have occurred before (1895-1997 = historical) and after (1998-2007 = recent) the Hamilton et al. (1998) status report to avoid overlap with their work.

All records (confirmed and unconfirmed) from the FWMIS database were used in this report; therefore caution must be used when reading this report. Some records have been confirmed (e.g., museum records or photos submitted) and I've stated in the text whether there is a photo or specimen for these locations. The vast majority of records do not have specimens or photos to verify identification. Museum records have specimens available for confirmation; however, I have not personally inspected the museum specimens to confirm that they were correctly identified. Tadpoles are extremely difficult to identify and a microscope and experience are required to distinguish among toad species. Therefore, all tadpole records should be considered suspect if a specimen is lacking and adult forms have not been seen in conjunction with the tadpole(s) for species confirmation. Calls of the western toad (*Anaxyrus boreas*, formerly *Bufo boreas*) and Canadian toad can also sometimes be difficult to distinguish. Records of calls without visual confirmation should not be assumed to be 100 % accurate.

Errors in the audio identification of species can occur if an observer heard a toad only briefly or from a distance, or if the call is obscured by extraneous noise (e.g., traffic, calls of other amphibian species). Visual identification errors of young individuals may occur

between Canadian toads and other true toads in Alberta because the boss (a bony lump on the head that distinguishes Canadian toads from other Alberta toads) may not be clearly visible in young-of-the-year (YOY) individuals, and color patterns can also vary. The experience level of observers contributing data also varies and may affect the accuracy of observations. The FWMIS database does have a column for the observer to list their confidence in the observation, so I have stated in the text below when observations were listed as probable. However, some of these probable observations may have been listed as probable because the observer was unsure of the number of individuals present rather than unsure of whether it was a Canadian toad heard. The other common type of error with these data is error in the location coordinates. Small errors will not affect this report; however, large coordinate errors could place an observation in the wrong region. Observation points attributed to AVAMP data and that occur beyond the normal range for the Canadian toad have been double checked by the AVAMP coordinator to ensure the coordinates match the location; therefore, it is unlikely that many errors of this type have persisted.

Despite the problems associated with data collected by so many different individuals, I chose to include both the confirmed and unconfirmed points because without the unconfirmed points there would not be enough data to detect trends. As long as the level of confidence in observations does not change with time, the uncertainty should not affect analysis of overall trend. The majority of points are likely correct; many have been submitted by experienced biologists or naturalists or have had photo evidence submitted with the observation.

If you notice any data missing in this report, or have any additional information to contribute, please submit your observations to the Alberta Volunteer Amphibian Monitoring Program so that they can be added to the database and included in any updates of this report.

DISTRIBUTIONAL TRENDS

Canadian toads have been observed from 52 of the 76 counties/land regions in Alberta (Table 1). Of the 52 regions in which Canadian toads have been observed, they have not been observed in 25 (48 %) of these regions in the past 10 years. Canadian toads are often observed in the Municipality of Wood Buffalo, Lakeland County, Municipal District of Bonnyville, and the Municipal District of Wainwright, but are rare (1-5 observations from 1998-2007) in the other 23 regions where they occur (Figure 1; See Table 1 for more information).

Table 1. Summary of current distribution (1998 – 2007). The year of last observation is listed in brackets for each county. “Possibly present” means that there has been an observation in the past 10 years, but it was listed as probable. In cases where the last observation is questionable (listed as uncertain in the database), the year of a more reliable observation is listed. All observations are counted in this tally, so for example, 10 observations from a county could be 10 observations of one toad from one site on 10 separate occasions within a year. However, when more than one observation was reported from the same site (same UTM coordinates) on the same day, this was only counted as one observation.

Grassland Natural Region:

Observation frequency	Counties (last observation)
Frequent (> 20 observations)	
Occasional (6-20 observations)	
Rare (1-5 observations)	Taber (2004); Newell (2001); Kneehill (2006); Special Areas Boards 1, 2, & 3 (Suffield – 2005)
Possibly present	Cypress (1997)
Not observed in past 10 years	Vulcan (1962); Warner (1895); Forty Mile (1986); City of Calgary (1967); Rocky View (1966); Wheatland (1967); Starland (1961); Paintearth (1951); Acadia (1996)
Never observed	Cardston; Willow Creek; Lethbridge

Parkland Natural Region:

Observation frequency	Counties (last observation)
Frequent (> 20 observations)	Wainwright (2007)
Occasional (6-20 observations)	
Rare (1-5 observations)	City of Edmonton (2006); Strathcona (2005); Elk Island National Park (2002); Lamont (2001); Beaver (2001); Vermilion River (2004); Wetaskiwin (1998); Leduc (2000); Sturgeon (2004)
Possibly present	Red Deer (1997); Lacombe (1997)
Not observed in past 10 years	Camrose (1997); Flagstaff (1971); Minburn (1962); Two Hills (1965); Provost (1996); Mountain View (1997); Ponoka (1953); Stettler (1997);
Never observed	Foothills

Boreal Forest Natural Region:

Observation frequency	Counties (last observation)
Frequent (> 20 observations)	Municipality of Wood Buffalo (2007); Lakeland (2006)
Occasional (6-20 observations)	Bonnyville (2007)
Rare (1-5 observations)	Opportunity (2001); Wood Buffalo National Park (2001); Woodlands (2003); Lac Ste. Anne (2000); Parkland (2002); Lesser Slave River (1998); Westlock (2004); Thorhild (2005); St Paul (1998);
Possibly present	Smoky Lake (no confirmed records); Athabasca (1965)
Not observed in past 10 years	Big Lakes (1961); Mackenzie (1993); Barrhead (1965)
Never observed	Saddle Hills; Grand Prairie; Smoky River; Fairview; Birch Hills; Peace; Spirit River; Sunrise

Foothills Natural Region

Observation frequency	Counties (last observation)
Frequent (> 20 observations)	
Occasional (6-20 observations)	
Rare (1-5 observations)	Yellowhead (2002);
Possibly present	
Not observed in past 10 years	Clearwater (1997);
Never observed	Bighorn; Brazeau; Greenview (?); Clear Hills; Northern Lights

Rocky Mountain Natural Region:

Observation frequency	Counties (last observation)
Frequent (> 20 observations)	
Occasional (6-20 observations)	
Rare (1-5 observations)	
Possibly present	
Not observed in past 10 years	
Never observed	Waterton Lakes National Park; Kananaskis; Pincher Creek; Ranchland; Banff National Park; Jasper National Park

The absence of observations in some areas may be simply because no one has looked for Canadian toads (e.g., Flagstaff County). However, extensive surveys have been conducted in areas where Canadian toads were historically present with no observations resulting (e.g., Elk Island National Park, City of Edmonton, Strathcona County, Red Deer River area), suggesting that declines in distribution have occurred. Canadian toads are still widespread, but the number of populations seems to have decreased in the Parkland and Grassland regions of Alberta despite an increase in survey effort (Figure 2 a, b).

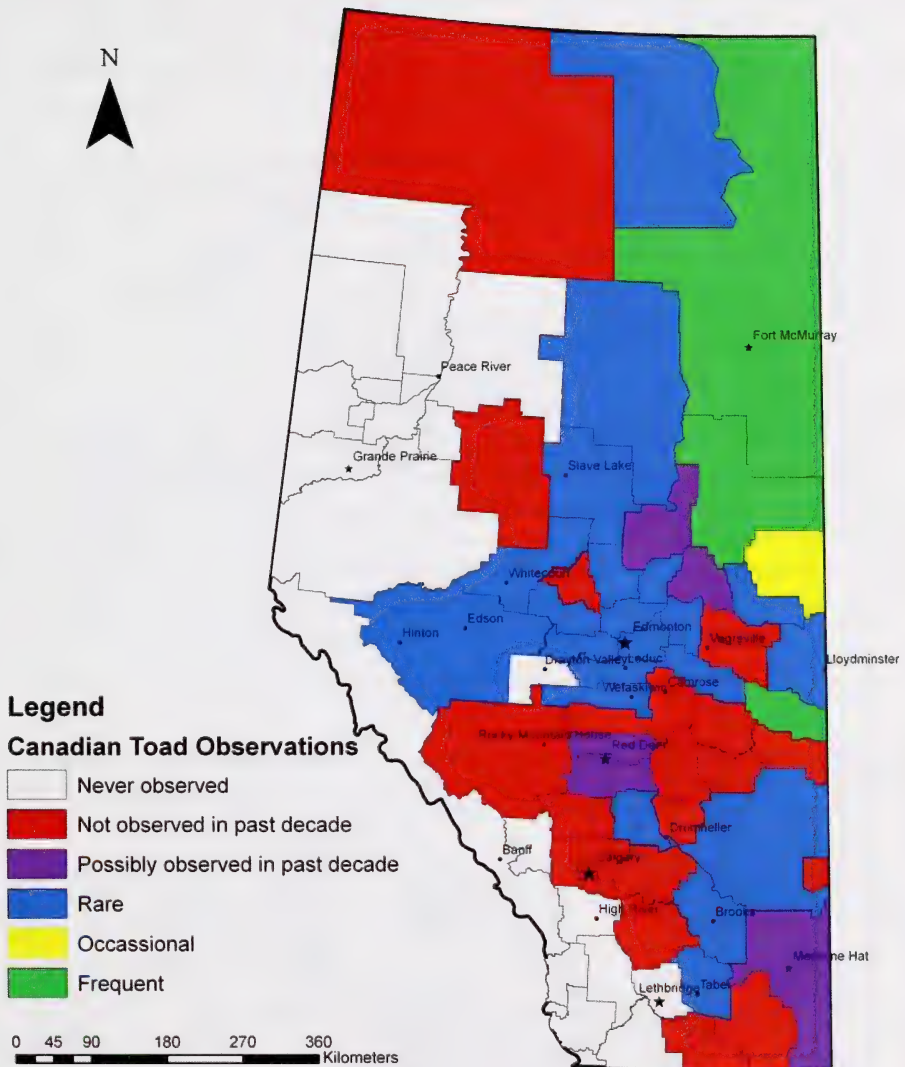
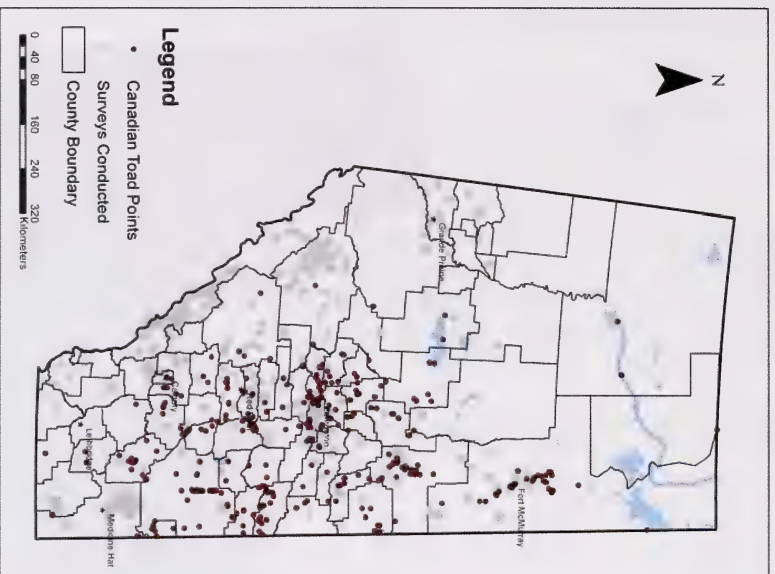


Figure 1. Map of Alberta with counties color coded to represent areas where Canadian toads have never been observed (white), were historically present but have not been observed in the past 10 years (red), have possibly been observed in the past 10 years (purple), are rare (blue), occasional (yellow), or frequent (green). Counties were classified as possibly observed if a probable observation was reported between 1998-2007, but no confident observations were made. Counties classified as rare had 1-5 observations, occasional had 6-20 observations, and frequent had over 20 observations reported between 1998-2007.

a. 1895-1997



b. 1998-2007

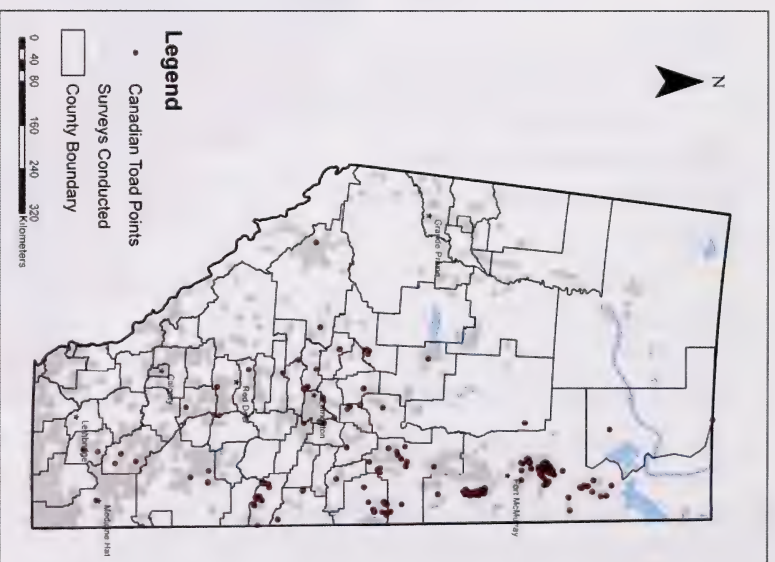


Figure 2. Canadian toad observations (red dots) recorded between (a) 1895-1997 or (b) 1998-2007. Observations include both confirmed (e.g., museum records) and unconfirmed (e.g., AVAMP) records. Grey dots indicate areas where people have surveyed for toads but not found any, or have reported observations of western toads, chorus frogs, or wood frogs (from the respective time frames). The absence of anuran observations from an area could be the result of an insufficient number of anurans or observers to detect presence from that area.

It is important to keep in mind that this analysis examined the change in population distributions and observation rates, not individual population sizes. For example, despite numerous recent records from some areas at the local level (e.g., Municipality of Wood Buffalo), declines in population size may still be occurring. The apparent abundance of toads from these areas could be due to a disproportionate increase in observation rate compared to other areas. Population-based studies and standardized surveys are needed to determine accurately whether or not this species is in decline.

The lack of province-wide, standardized surveys makes it difficult to assess the status of Canadian toads in Alberta. However, if we assume that wood frog (*Lithobates sylvaticus*, formerly *Rana sylvatica*) populations have been fairly constant and if we assume that survey effort has not changed disproportionately among species, then we can get an idea of distributional changes by comparing the number of Canadian toad observations to wood frog observations (Table 2). I used the proportion of wood frog observations collected between 1998-2007 versus 1988-1997 (i.e., number of wood frogs observed from 1998-2007 divided by number of wood frogs observed from 1988-1997) as a standard to compare to the same proportion for Canadian toad observations to determine if the increase in observations this past decade is proportional to the increase in observation effort (since effort was not recorded). The wood frog was chosen because this species is easy to detect, has the greatest number of observations of the amphibians in Alberta, and is believed to have relatively stable populations in Alberta (ASRD 2007). A Goodness-of-fit test (*G*-test with Williams correction) revealed that the proportion of Canadian toad observations collected from 1998-2007 versus 1988-1997 was significantly lower than would be expected if the population were stable ($G = 50.619$, 1 df, $p < 0.05$).

Table 2. Change in observation rate over time for Canadian toads, western toads, boreal chorus frogs, and wood frogs. These numbers were calculated from Alberta Fish and Wildlife's FWMIS data. The number of observations has increased over time as a result of an increased number of observers.

Decade	Canadian Toad		Western Toad		Boreal Chorus Frog		Wood Frog	
	# obs.	Ratio	# obs.	Ratio	# obs.	Ratio	# obs.	Ratio
98-07	537	1.642	2997	5.876	6423	2.791	7209	2.744
88-97	327	1	510	1	2301	1	2627	1
78-87	29	0.089	2	0.004	0	0	0	0
68-77	68	0.208	5	0.010	0	0	6	0.002
58-67	65	0.208	0	0	0	0	0	0
Pre-58	54	0.199	0	0	0	0	0	0

Evidence that supports the first assumption for this test is: 1) The proportion of boreal chorus frog (*Pseudacris maculata*) observations reported from 1998-2007 versus 1988-1997 was not significantly different from the proportion of wood frogs ($G = 0.494$, 1 df, $p > 0.05$). Wood frogs and boreal chorus frogs are ranked as Secure in the province (ASRD 2007) and have not likely experienced any major population changes over the past two decades. 2) The proportion of western toad observations reported from 1998-2007 versus 1988-1997 is significantly greater than the ratio for wood frogs ($G =$

300.845, 1 df, $p < 0.05$). An increase in western toad observations was expected, as this species appears to be expanding its range eastwards in Alberta (Wind and Dupuis 2002). However, the analysis may be inaccurate if either of the assumptions is invalid. It is possible that the increasing number of people submitting observations could be submitting a disproportionately greater number of observations made in/near human settlements. Wood frogs and chorus frogs are considered more habitat generalists than the toads, and therefore, may be more able to survive in or near human settlements. This could cause a disproportionate increase in wood and chorus frog observations compared to Canadian toads and could invalidate this analysis. On the other hand, wood frogs and chorus frogs may have experienced population declines in the past decade (e.g., due to wetland loss), which could cause an overestimate of Canadian toad numbers using this analysis. Therefore, caution must be used regarding these results, but without standardized surveys available, this analysis is likely the best estimate available for detecting trends in Canadian toad population numbers in Alberta.

The trends in Canadian toad observation rates compared to wood and chorus frog observation rates were then examined in more detail to assess what regions of the province were in decline. The proportion of Canadian toad observations collected between 1998-2007 versus 1988-1997 was compared to the proportion of wood and chorus frog observations collected during the same time periods for each eco-region. This analysis showed that Canadian toad observations, compared to frog observations, have significantly decreased in the Grassland and Foothill eco-regions, significantly increased in the Boreal region, and experienced insignificant change in the Parkland region (Table 3). Canadian toads are currently very rare in most counties in the Parkland region, with the exception of Wainwright County where healthy populations exist (Figure 1). Understanding the pattern of declines is important for conservation efforts to be successful, so I analyzed the Parkland region data again, but excluding Wainwright County, and found that this region has also experienced a significant decrease in Canadian toad observations (compared to frog observations) with the exception of Wainwright County ($G = 11.072$, 1 df, $p < 0.05$).

Table 3. Change in observation rate over time for Canadian toads and frogs. The number of Canadian toad and frog observations are listed by natural region for two time periods, 1988-1997 and 1998-2007. The ratio of the number of observations between 1988-1997 and 1998-2007 was compared between Canadian toads and frogs. G -values greater than 3.841 are considered significant ($\alpha = 0.05$) which indicates a significant increase or decrease in Canadian toad observations compared to frogs. Wood frogs and chorus frogs were both used because wood frogs do not occur in southeastern AB. These numbers were calculated from Alberta Fish and Wildlife's FWMIS data.

Region	Canadian toad			Wood & Chorus Frogs			Trend for CATO	G -value
	#obs. 88-97	#obs. 98-07	Ratio	#obs. 88-97	#obs. 98-07	Ratio		
Grassland	132	16	0.121	667	2514	3.769	Decreasing	317.740
Parkland	50	66	1.320	1390	2335	1.680	Decreasing	1.768
Boreal	98	452	4.612	1936	5564	2.874	Increasing	19.879
Foothills	6	3	0.500	258	2125	8.236	Decreasing	14.793

Assuming that the increase in observation rate has been approximately 2.7x from 1988-1997 to 1998-2007 (calculated from the increase in wood frog observations), we would expect to have approximately 897 Canadian toad observations from 1998-2007 if there were no decline. Since only 537 Canadian toad observations were reported, this suggests that the Canadian toad population has declined by approximately 40.1 % from 1988-1997 to 1997-2007 in Alberta.

The cause of Canadian toad population declines is unknown; however, habitat loss and degradation (e.g., disturbance to hibernacula, impacts of forestry, wetland alteration), climate change (e.g., reduced water levels or snow cover), pesticide use (Relyea 2005), spread of pathogens, fish introductions (e.g., stocking trout in dugouts), competition with other species (e.g., western toad), and UV radiation have been suggested as possible threats. It's likely that the cumulative effects of more than one threat are responsible for Canadian toad declines, or that different threats are responsible for different populations.

Without further study, it is difficult to say why some areas of the province have experienced declines in observation rates while others have not. However, different land use patterns likely play a role. The Grassland and Parkland regions have experienced great wetland loss as a result of agricultural land use (Wilson et al. 2001). Wainwright County again may be the exception because the Department of National Defense's Base Wainwright occurs here and protects a proportion of the land base from various land use pressures. An increase in the proportion of Canadian toad observations in the Boreal region was unexpected. This pattern could be the result of Canadian toad populations increasing in this region or the observation rate of toads and frogs may have increased disproportionately to each other. The Boreal region is currently lightly disturbed, yet poised for much greater industrial development over the next 20 years (Foote and Krogman 2006). Canadian toad populations should be monitored and managed carefully during this development to prevent further declines.

DETAILED TRENDS BY REGION

Grassland Natural Region:

Cardston County:

1998-2007: Amphibian surveys were conducted in July 2006 at Belly River, Crooked Creek, Waterton River, Cottonwood Creek and Dungarven Creek; no toads (of any species) were observed (R. Newell, pers. comm.). Canadian toads have never been recorded from this area.

Willow Creek: Canadian toads have not been recorded from this area.

Vulcan:

Pre-1998: One record exists for this region; it is a museum specimen that was collected in 1962 by the Canadian Museum of Nature.

Lethbridge: Canadian toads have not been recorded from this area.

Warner:

Pre-1998: One record exists for this region; it was collected in 1895 by the Canadian Museum of Nature.

Taber:

1998-2007: Two records exist for Taber County over the past 10 years. 10 YOY were observed in 2004 in the northeastern region of Taber County. The other was a possible observation made by an Alberta Volunteer Amphibian Monitoring Program volunteer (AVAMPV) of 2 calling males in 1998 just east of the city of Taber.

Pre-1998: An AVAMPV also observed one toad in 1996 approximately 4 km north of Purple Springs and heard 2 Canadian toads calling in 1994 at Fincastle Lake (K. Kendell, pers. comm.).

Newell:

1998-2007: Three records exist for Newell County over the past 10 years. In 2001, Lisa Takats Priestley observed one adult south of Brooks and 2 adults northeast of Brooks. One adult was observed by an AVAMPV southeast of Brooks in 1998.

Pre-1998: Historical records exist for a number of locations in this county. Lisa Takats Priestley observed one Canadian toad near Brooks in 1997. Two calling Canadian toads were reported in 1987 as a probable observation. The University of Alberta Museum of Zoology has 8 specimens from 3 locations collected between 1950 and 1979 from this county. The American Museum of Natural History collected Canadian toad specimens from 3 locations in Newell County: 4 individuals from Brooks in 1954, one individual from a site along Route 1 east of Bassano in 1966, and one from Dinosaur Provincial Park in 1971. The Canadian Museum of Nature has one specimen collected in 1919 and 78 toads collected from three sites near Brooks in 1962 (Cook 1983).

Francis Cook described the Canadian toad as being common in the irrigated areas near Brooks in 1963 (F. Cook, pers. comm. in Hamilton et al. 1998). Now it is apparently rare in this area (D. Scobie, pers. comm. in Hamilton et al. 1998). This suggests that Canadian toads have decreased in this area since there has been increased surveying of wildlife populations in this region but very few observations of Canadian toads made (L. Takats, pers. comm. in Didiuk 2003).

Eaton et al. (2005) examined the life-history variation among populations of Canadian toads in Alberta. One of their nine study locations was located in Newell County in the Brooks area. They estimated the age and growth rates of 237 Canadian toads in the province, 85 of these toads were from the Brooks area. These samples were collected by the Canadian Museum of Nature (n = 81) from 19-20 May 1962 and by the University of Alberta Museum of Zoology (n = 4) on 7 April 1983.

Forty Mile:

Pre-1998: The only records for this county are observations made at two sites by Cleve Wershler in 1986 of 5 and 10 Canadian toads in eastern Forty Mile County.

Cypress:

1998-2007: Researching Amphibian Numbers in Alberta (RANA) is a program that initiated in 1996 surveying amphibians using pond surveys (visual and auditory observations) and pitfall traps at a number of sites in eight areas of the province (see below county summaries). One of the RANA sites is located in Cypress Hills Provincial Park. Here, amphibians were surveyed using pitfall traps and visual surveys from 1999 to 2004 at the main RANA site in Cypress Hills and 32 ponds were surveyed in 2004. No Canadian toads were found at these sites (Wilkinson and Berg 2004). However, an AVAMPV reported a possible observation of 4 toads near Medicine Hat in 2003.

Pre-1998: A consultant observed one Canadian toad in 1997 in northeastern Cypress County. And one Canadian toad was observed at two sites in the northeastern region in 1996.

City of Calgary:

Pre-1998: The Canadian Museum of Nature has 39 Canadian toad specimens collected from one area in Calgary in 1966 and 1967 (Cook 1983).

Rocky View:

Pre-1998: Canadian toads have not been reported from this area in the past four decades, but museum specimens have been collected from five locations in this county. The Canadian Museum of Nature has one specimen from each of four locations collected from the eastern part of this county between 1961 and 1966. The University of Alberta Museum of Zoology has two specimens collected from one location in northeastern Rocky View in 1951.

Kneehill:

1998-2007: Two observations were made in the past 10 years; one Canadian toad was observed in the southern region of Kneehill in 2006 and an adult Canadian toad was observed in the northeast corner of the county in 1999.

Pre-1998: An AVAMPV reported a probable occurrence of 5 Canadian toads calling near the eastern border in 1996. Wayne Smith observed three Canadian toads in northeastern Kneehill in 1972. The University of Alberta Museum of Zoology has 6 specimens collected from one location in southeastern Kneehill in 1950. Breeding populations of Canadian toads used to occur along Kneehill's Creek, but they declined and have not been observed since the late 1990's (W. Roberts, pers. comm.).

Wheatland:

Pre-1998: An AVAMPV reported one probable occurrence of a Canadian toad calling from one location in northeastern Wheatland on three different days in 1996. Besides from this probable observation, Canadian toads have not been observed in this county since 1967. The Canadian Museum of Nature collected 22 individuals from five locations in central/western Wheatland between 1963 and 1967 (Cook 1983). The University of Alberta Museum of Zoology collected one individual from northeastern Wheatland in 1950.

Starland:

Pre-1998: Canadian toads were collected at three locations in this county by the Canadian Museum of Nature: one individual in 1924, two in 1925, and one in 1961.

Paintearth:

Pre-1998: An AVAMPV reported one probable occurrence of a Canadian toad calling in the southwestern region of this county in 1996. Besides from this probable occurrence, the last record was in 1951 where the University of Alberta Museum of Zoology collected one individual from southeastern Paintearth County.

Special Areas Board 1, 2, & 3 (Suffield):

1998-2007: A M.Sc. student from the University of Alberta spent much time in the field in this area in 2007 conducting avian research and observed 4 Great Plains toads but no Canadian toads (L. Hamilton, pers. comm.). However, recent observations do exist. An AVAMPV observed one young toad in 2005 approximately 51 km east of Hanna. Lisa Takats Priestley observed 4 adults at one location and 5 at another location (~ 1 km apart) in 2001 in the northern region of this area. And an AVAMPV submitted a photograph of a Canadian toad found near Spondin in ~2000 (K. Kendell, pers. comm.).

Pre-1998: 113 historical (before 1998) observations exist for this region for 57 sites. Observations were made from five locations in the southeastern region below Acadia. Wayne Smith reported a probable occurrence of 6 individuals calling from a site in 1988, 35 individuals calling in 1991 from a second site, and 12 individuals in 1989 and 4 in 1993 calling from a third site. Cleve Wershler reported a probable occurrence of 10 individuals calling in 1986. The University of Alberta Museum of Zoology collected three individuals from one location in 1951.

An AVAMPV observed two adults at a breeding site along the border of Newell in 1996. Cleve Wershler reported a probable occurrence of 10 individuals calling in 1986 from each of two sites in the eastern part of this region. One individual was collected by the University of Alberta Museum of Zoology in 1952 near Hanna.

Canadian toads have been reported from four locations in the northern part of this region. An AVAMPV reported a probable occurrence of one individual calling at two locations in 1996. Wayne Smith reported a probable occurrence of three individuals calling in 1989. Cleve Wershler reported a probable occurrence of ten individuals calling in 1982.

Ninety-nine observations of Canadian toads have been submitted for approximately 44 sites in the central part of this region for a total of 324 individuals observed between 1930 and 1996. Consulting companies, the Royal Ontario Museum, and the University of Alberta Museum of Zoology made these submissions.

Acadia:

Pre-1998: Two older records exist for this area. Wayne Smith observed one Canadian toad along the southern border of Acadia in 1996. Cleve Wershler reported a probable occurrence of 10 Canadian toads calling at a site in northern Acadia in 1986.

Parkland Natural Region:

Foothills: Canadian toads have not been recorded from this area.

Mountain View:

Pre-1998: The last observation made in this county was in 1997; An AVAMPV observed one Canadian toad. The University of Calgary Museum collected one Canadian toad in 1975, 78 m south of Sundre at Farten Timber Creek. The University of Alberta Museum of Zoology has three specimens collected from one location in 1951.

Red Deer:

1998-2007: Only two possible records exist in Red Deer County over the past ten years. An adult was observed by an AVAMPV approximately 38 km south of Red Deer in 2000. The other was a possible call heard by an AVAMPV on the eastern border of Red Deer County in 1999.

Pre-1998: Red Deer County has a number of older records for Canadian toads. An AVAMPV observed one individual in 1997. The University of Alberta Museum of Zoology has 6 specimens from 5 locations between 1949 and 1987. The University of Calgary Museum collected one Canadian toad near the Pine Lake Government campground in 1975. The Canadian Museum of Nature has 3 specimens collected from two locations in 1963.

Canadian toads appear to have experienced declines in this county, even in protected areas. Canadian toads used to occur at Ghostpine Springs Sanctuary but haven't been heard or seen since 1990. Formerly robust populations along the Red Deer River west of Innisfail have disappeared (no sightings since 1989). Canadian toads used to be common in the badlands along the Red Deer River, but declined dramatically in this

area in the 1990's, only a single young of the year specimen was seen in 1996. This area has been regularly monitored since the 1980's. (Roberts 1992, 1994; W. Roberts, pers. comm.)

Lacombe:

1998-2007: Only one possible call (1998 by an AVAMPV) of one Canadian toad was recorded over the past 10 years in Lacombe County.

Pre-1998: An AVAMPV observed one Canadian toad calling in central Lacombe County in 1997. Wayne Smith heard Canadian toads calling from two locations in 1990 in the eastern part of the county. The University of Alberta Museum of Zoology collected one individual at two sites (southwestern Lacombe County and along the southern border) in 1953 and 15 individuals in the eastern part of the county in 1963. The Canadian Museum of Nature collected one individual from another site in 1947 and one individual from along the eastern border in 1962.

Ponoka:

Pre-1998: An AVAMPV reported a probable observation of a calling toad in 1996. Two museum records exist for one location in Ponoka County: The Canadian Museum of Nature collected one individual from the central/eastern region in 1928 and the University of Alberta Museum of Zoology collected one individual from this same location in 1953.

Stettler:

Pre-1998: An AVAMPV reported a probable observation of a Canadian toad calling in May 1997 and confirmed this observation with a visual sighting of an adult in August 1997 at the same location. The University of Alberta Museum of Zoology collected one Canadian toad near Stettler in 1953 and one toad from Buffalo Lake in 1972. Eight of the 40 toads used in Bursey and Goldberg (1998)'s study were collected at Buffalo lake <1977 by the University of Alberta Museum of Zoology (W. Roberts, pers. comm.). The Royal Alberta Museum has one Canadian toad collected from the Nevis campground in 1971. The Canadian Museum of Nature collected one individual from the western border in 1962.

Fisher and Roberts (1994) conducted nine sets of standardized amphibian surveys from May to July 1994 at 10 sites in this county (along with 8 sites in Camrose and Wetaskiwin counties), but no Canadian toads were observed.

Eaton et al. (2005) examined the life-history variation among populations of Canadian toads in Alberta. One of their nine study locations was located in Stettler County in the Buffalo Lake area. They estimated the age and growth rates of 237 Canadian toads in the province, 20 of these toads were from the Buffalo Lake area. These samples were collected by the University of Alberta Museum of Zoology from 13 May 1953 to 14 July 1977.

Wetaskiwin:

1998-2007: Only one observation has been made in the past 10 years for this county and it was one Canadian toad observed in central Wetaskiwin County by an AVAMPV in 1998.

Pre-1998: Historical records exist for three locations in this region. The University of Alberta Museum of Zoology collected 8 Canadian toads from Pigeon Lake in 1976 and 1977. The Royal Alberta Museum collected two individuals from Battle Lake in 1971. The Royal Ontario Museum collected one Canadian toad from a site in Wetaskiwin in 1920.

Fisher and Roberts (1994) conducted nine sets of standardized amphibian surveys from May to July 1994 at 4 sites in this county (along with 14 sites in Camrose and Stettler counties), but no Canadian toads were observed.

Leduc:

1998-2007: An AVAMPV observed Canadian toads on three occasions (1, 2, and 3 adult individuals) between May and July 2000 at one location in western Leduc County.

Pre-1998: The same AVAMPV as above also observed one Canadian toad at three locations within a 2 km area in western Leduc County in 1996-1997.

Older historical records exist for two locations; the Royal Alberta Museum collected one individual near the Edmonton International Airport in 1970 and another individual at a site 5.6 km northwest of Devon in 1969.

Sturgeon:

1998-2007: Only one record exists for this county over the past 10 years. An AVAMPV observed one Canadian toad on three occasions in southern Sturgeon County in 2004.

Pre-1998: An AVAMPV reported a probable observation of two Canadian toads calling in 1997. The University of Alberta Museum of Zoology collected one Canadian toad in 1950.

City of Edmonton:

1998-2007: Toads are very rare in the city of Edmonton. Canadian toads have been reported from the Clover Bar waste management area and from Terwilliger Park in recent years (C. Paszkowski, pers. comm.). Three observations of Canadian toads have been made from Terwilliger Park over the past four years: Chris Garret (M.Sc. student) heard a male Canadian toad calling at Terwilliger Park in 2004 (C. Garret, pers. comm.), Shelly Boss (wildlife biologist) caught an adult female Canadian toad in 2005 (C. Paszkowski, pers. comm.), and an AVAMPV reported a Canadian toad (with photo confirmation) also from 2005 (K. Kendell, pers. comm.). Brett Scheffers (M.Sc. student) conducted amphibian surveys in the city of Edmonton from June to August 2007 and did not locate any toads (despite repeated visits to Terwilliger Park).

Pre-1998: Canadian toads were considered common in the Edmonton region in 1963 (F. Cook, pers. comm. in Hamilton et al. 1998). They were heard and seen frequently along the North Saskatchewan River as recently as the late 1980's (W. Roberts, pers. comm.).

Records of Canadian toads exist for 11-13 locations pre-1998. A single young of the year Canadian toad was found near the pond in Hawrelak Park in 1991 (W. Roberts, pers. comm.). This pond and the riparian area have been surveyed regularly since the late 1970's; toads have not been seen or heard calling at this site during this period (W. Roberts, pers. comm.). Canadian toads were occasionally found near this site along the nearby North Saskatchewan River as recently as 1989 (W. Roberts, pers. comm.). An AVAMPV reported Canadian toad tadpoles at a site near 199 St and 107 Ave in 1997; however, this record is highly suspect because tadpoles are very difficult to identify correctly and Wayne Roberts has been conducting call surveys in this area since the 1980's and has only heard western toads from this area. An AVAMPV observed one adult Canadian toad near Whitemud Ravine (~23 Ave and 119 Street) in 1995. The Royal Alberta Museum collected one toad from a small park approximately 1 km from Terwilliger Park in 1971. The Royal Alberta Museum also collected two Canadian toads from Rabbit Hill in 1971. The Canadian Museum of Nature collected one adult from a site near 100 Ave and 184 Street and another site west of Anthony Henday Drive and south of Stony Plain Road in 1963. The Canadian Museum of Nature collected 2 adult toads near the low-level bridge in 1914 and the University of Alberta Museum of Zoology collected 3 adults from this site in 1950 and one in 1957. The Royal Ontario Museum collected one toad from the Winterburn area and another toad from an unspecified location in Edmonton in 1949. In addition to these, W. Rowan collected 5 Canadian toads from an unspecified location in Edmonton in 1924, which are held at the Harvard University Museum of Zoology (HerpNet 2008).

Strathcona:

1998-2007: Only one observation exists for this region in the past 10 years; one Canadian toad was heard calling at the northern part of this county near Vinca Bridge in 2005 (C. Priestley, pers. comm.).

Sara Eaves (M.Sc.) may have heard a Canadian toad call at the Strathcona County land (TWP 54, RG 20, Section 31 SW) in 2001 (B. Eaton, pers. comm.). Several field assistants and I conducted intensive amphibian surveys at this site in 2003, 2004, and 2006. A large western toad population occurs at this site, but no Canadian toads were found (C. Browne, pers. obs.).

Pre-1998: An AVAMPV reported a Canadian toad in 1995 by Dow Chemical and another observation was reported just north of this site of 10 tadpoles in 1997. The University of Alberta Museum of Zoology collected one Canadian toad in 1950 and another from a site adjacent to Elk Island National Park also in 1950. The Royal Ontario Museum collected two Canadian toads from Cooking Lake in 1949. The Canadian Museum of Nature collected one Canadian toad from the southeastern region of Strathcona County in 1907.

Canadian toads were common throughout the Sherwood Park area in the 1960's and used to occur at Village on the Lake, Broadmoor Lake, Woods (now Ball) Lake, Heritage Hills, and various ephemeral pools (L. Girvan, pers. comm.). Canadian toads have not been seen or heard in the Sherwood Park area since 1975 (L. Girvan, pers. comm.).

Elk Island National Park:

1998-2007: Canadian toads appear to be extirpated or in very low abundance in Elk Island National Park (EINP). Browne et al. (2003) conducted visual surveys at 232 ponds in EINP north of highway 16 between May and August in 2003; western toads were found at 40 sites, but no Canadian toads were observed. Additional amphibian surveys were conducted in EINP from 2004 – 2007 by Ph.D. students Connie Browne and Arthur Whiting and their field assistants, but still no Canadian toads were observed (pers. obs.; A. Whiting, pers. comm.). Lisa Matthias (AB Fish and Wildlife) has also seen/heard western toads in the park in recent years but not Canadian toads (L. Matthias, pers. comm.).

Sara Eaves (M.Sc.) conducted roadside amphibian call surveys in 2001/2002. She only heard a few calling male Canadian toads in 2001 and only one individual in 2002 (S. Eaves, pers. comm.). Chuck Priestley also heard Canadian toads calling in 2001; he heard one individual calling from two locations along the main road in EINP.

Pre-1998: Burns (1986) conducted an amphibian and reptile survey in 1986; only one Canadian toad was observed during these surveys. Gordon Burns also reported Canadian toads observed in Elk Island in 1969, 1971, 1972, 1975, and 1985 and the Canadian Museum of Nature collected one Canadian toad from EINP in 1962.

Western toads were not historically reported in EINP, but it is not believed that the western toad's colonization of this area is responsible for the Canadian toad's decline. Canadian toads were already rare during Burns' (1986) surveys in 1986 and the first western toad wasn't reported until 1990 (Browne et al. 2003). However, it is possible that western toads occurred in the park before the 1990's but that individuals who reported sightings of toads just assumed that they were Canadian toads because this was the only toad species listed on Elk Island's species list.

Camrose:

Pre-1998: An AVAMPV observed one Canadian toad at a site near Buffalo Lake in 1997. Wayne Smith observed one toad on two occasions in 1972 at a site in the northern part of this county. The University of Alberta Museum of Zoology collected 1 Canadian toad near Camrose in 1953, 17 toads from a site on Buffalo Lake in 1972, 1977, and 1979, and 2 toads from a site near Buffalo Lake in 1977.

Fisher and Roberts (1994) conducted nine sets of standardized amphibian surveys from May to July 1994 at 4 sites in this county (along with 14 sites in Stettler and Wetaskiwin counties), but no Canadian toads were observed.

Lamont:

1998-2007: Arthur Whiting and Connie Browne (amphibian ecology Ph.D. students) observed western toads in this county while doing fieldwork from 2004-2006, but no Canadian toads were observed (A. Whiting, pers. comm.; pers. obs.). However, Chuck Priestley heard one Canadian toad calling at 3 locations along the north boundary of EINP in 2001.

Pre-1998: Canadian toads have been collected from two locations in southeastern Lamont County by the Canadian Museum of Nature in 1962 and 1965.

Beaver:

1998-2007: One of the RANA sites occurs at Beaverhill Lake in this county, but no toads were observed (Wilkinson and Berg 2004). Biologists working at Kinsella heard chorus frogs calling in 2007 (B. Shore, pers. comm.) and 2004-2005 (P. Dewitt, pers. comm.) but also no toads. However, Chuck Priestley heard one Canadian toad calling in western Beaver County in 2001.

Pre-1998: A probable observation of a Canadian toad calling was reported in 1996 at the Beaverhill Bird Observatory. The University of Alberta Museum of Zoology collected 15 Canadian toads from a site on Beaverhill Lake in 1964 and one individual from a site near the western border in 1962. The Canadian Museum of Nature collected a Canadian toad at another site near Beaverhill Lake in 1925 and the University of Alberta Museum of Zoology collected an individual from this same site in 1953. W. Rowan collected 2 Canadian toads from Beaverhill Lake in 1926, which are held at the Harvard University Museum of Zoology (HerpNet 2008).

Eaton et al. (2005) examined the life-history variation among populations of Canadian toads in Alberta. One of their nine study locations was located in Beaver County in the Beaverhill Lake area. They estimated the age and growth rates of 237 Canadian toads in the province, 16 of these toads were from the Buffalo Lake area. These samples were collected by the University of Alberta Museum of Zoology from 5 July 1953 to 20 May 1964.

Flagstaff:

Pre-1998: Canadian toads have not been reported from this area since 1971. Historical records exist for five locations in this county. The Royal Alberta Museum collected one toad from Hardisty campsite, Battle River (east side of Flagstaff) in 1971. The Canadian Museum of Nature collected one individual from each of three sites in 1962. And the University of Alberta Museum of Zoology collected one individual from eastern Flagstaff County in 1953.

It is unclear whether the absence of Canadian toads from this county in recent years is due to declines or lack of surveys because survey effort has been particularly low (Figure 2).

Minburn:

Pre-1998: The only records for this county are specimens stored at the Canadian Museum of Nature of one Canadian toad from each of two sites in 1962.

Two Hills:

1998-2007: Lisa Matthias conducted surveys for Canadian toads at two locations in eastern Two Hills County on 16 May 2005, but no toads were heard.

Pre-1998: The only records for Canadian toads from this area are two specimens held at the Canadian Museum of Nature of one Canadian toad collected from each of 2 sites, in 1962 and 1965.

Vermilion River:

1998-2005: Lisa Matthias surveyed six sites near Vermilion on 17 May 2005, but did not observe any toads. However, observations exist for three sites in the past ten years. An AVAMPV observed 3 Canadian toads and 2 egg masses in 2004 in the southeast corner of the county. In 1998, 2 and 9 toads were observed at two locations northwest of Vermilion.

Pre-1998: Records of Canadian toad exist for three locations pre-1998. An AVAMPV reported Canadian toads calling approximately 3 km northwest of Vermilion in 1996. The Royal Alberta Museum collected one individual from Soft Creek in 1970. The University of Alberta Museum of Zoology collected 2 Canadian toads at a site approximately 3 km southeast of Vermilion in 1953.

Wainwright:

1998-2007: Canadian toads are common in this area and can be heard calling from almost every wetland in May/June (S. Mascarin, pers. comm.). Base Wainwright (Department of National Defense) has been conducting amphibian surveys at 13 sites since 2004 and Canadian toads occur at all of these sites (S. Mascarin, pers. comm.). Shane Mascarin reported Canadian toads from 16 locations between 2002-2007 and has submitted photo evidence.

Chris Garret (M.Sc. student) worked in this area in 2006 and regularly heard Canadian toads calling (a 3 on the call scale) at Killarney Lake near Chauvin, AB (near the SK border) and also saw a few wandering in the woods in Dillberry Lake Provincial Park (near the SK border; C. Garret, pers. comm.).

Three observations were made in 1999; two of Canadian toads calling in the south-central region of the county and one on the eastern border of the county of approximately 4 toads calling.

Pre-1998: Canadian toads have been reported from 10 locations in Wainwright County pre-1998. A consulting company visited four sites in southeastern Wainwright County in 1997 and heard approximately 20 Canadian toads calling at two of the sites and observed approximately 10 toad tadpoles at the other two sites. Cleve Wershler heard approximately 10 toads calling from a site near the Saskatchewan border in 1986; Wayne Smith visited this same site in 1993 and reported a probable observation of one individual calling. Wayne Smith also reported an observation of 2 toads at another site near the border in 1986 and approximately 40 individuals at a different site (farther west) in 1990. The Royal Alberta Museum collected one toad from Edgerton in 1975. The University of Alberta collected one individual near the town of Wainwright in 1953 and three individuals from a site in the eastern part of the county in 1971.

Provost:

Pre-1998: Canadian toads have not been reported from this area since 1996, but have been reported from 8 locations. A consultant observed 4 and 3 toads at two sites in the northwestern region in 1996. Wayne Smith observed 2 Canadian toads in the central region in 1989. Cleve Wershler heard approximately 10 Canadian toads calling from a site in south/central Provost County in 1982, observed approximately 100 adults at a site in the central region in 1986, and heard approximately 10 calling at a site in the north/central region also in 1986. The University of Calgary Museum collected one Canadian toad from Sounding Lake in 1975. The Canadian Museum of Nature collected one toad at a site near the Saskatchewan border in 1962.

Boreal Forest Natural Region:

Woodlands:

1998-2007: Four recent observations exist for Woodlands County; all four locations are from the same general area, just north of Barrhead County. All four observations were made by a consulting company in 2003.

Pre-1998: Four Canadian toads were collected by the University of Alberta Museum of Zoology from one location in Woodlands County (near the border of Barrhead County) during three time periods, 1950, 1988, 1992.

Barrhead:

Pre-1998: Canadian toads have not been reported from this area since 1965. The Canadian Museum of Nature collected four Canadian toads from three locations between 1963 and 1965 in this county.

Lac Ste. Anne:

1998-2007: Canadian toads have been observed from two locations (~0.5 km apart) in Lac Ste. Anne in the past 10 years. Both observations were made an AVAMPV; one was of 20 adults in 1999 and the other was one adult observed in 2000.

Pre-1998: An AVAMPV reported a probable observation of 5 Canadian toads calling on 22 April 1997. A consultant observed 20 toad tadpoles on 11 July 1997 and observed 2 young of the year Canadian toads on 20 August 1996 at a site 600 m from the first. One adult Canadian toad was observed in 1996 approximately 400 m from these last two sites. The University of Alberta Museum of Zoology collected nine Canadian toads from four locations in this county in 1966, 1968, 1976, and 1977. The Canadian Museum of Nature collected two toads from another location in 1963. W. Rowan collected two Canadian toads from Devil's Lake, one in 1924 and another in 1928, which are held at the Harvard University Museum of Zoology (HerpNet 2008).

Parkland:

1998-2007: Lisa Matthias has searched for toads in Wagner Bog and observed western toads, but no Canadian toads (L. Matthias, pers. comm.). Wayne Roberts has conducted spawning/calling surveys for toads in the Wagner Natural Area, Atim creek and Big Lake

areas for the past 20 years and neither saw nor heard Canadian Toads during this time (W. Roberts, pers. comm.).

Three recent records do exist for Canadian toads in Parkland County. An AVAMPV observed 2 Canadian toads (unknown age class) in 2002 in north-central Parkland County. Another AVAMPV observed Canadian toads at two locations in the southeastern region of Parkland County: 6 adults in 1999 and 7 tadpoles in 2001.

Pre-1998: Canadian toads have been observed from 18 locations in Parkland County prior to 1998. An AVAMPV observed one toad in 1997. The University of Alberta Museum of Zoology collected 32 Canadian toads from 13 locations during the years 1939, 1950, 1961, 1962, 1964, 1968, 1972, 1976, and 1979. The Royal Alberta Museum has one Canadian toad that was collected in 1969 from a site near Spruce Grove. The Canadian Museum of Nature collected one toad at one site and 55 toads from another site near Stony Plain in 1965 (Cook 1983).

Lesser Slave River:

1998-2007: Western toads are common in this area, but Canadian toads seem to be very rare. A RANA site was ran in Lesser Slave Lake Provincial Park from 1997 – 2004. One Canadian toad was observed during the RANA study (in 1998), while 2673 western toads were observed during this period. An additional 15 sites were surveyed in 2004, but no Canadian toads were observed (Wilkinson and Berg 2004).

Pre-1998: Five confirmed locations exist for Canadian toads before 1998 for this region. Brian Eaton (Ph.D. amphibian ecologist) observed one Canadian toad at a site in the northeastern region in 1996. The University of Alberta Museum of Zoology collected 1 individual from the northeastern region in 1951, 2 individuals from Slave Lake in 1954, and 22 individuals from a site in the southern region of this county in 1957. The Royal Ontario Museum collected one Canadian toad from the east shore of Lesser Slave Lake in 1926.

Westlock:

1998-2007: An AVAMPV observed 8 Canadian toads in 2004 in central Westlock County. Another AVAMPV observed one Canadian toad in 2000 in eastern Westlock County.

Pre-1998: An AVAMPV observed one Canadian toad at a site in the northeastern region in 1997. The Canadian Museum of Nature collected one toad from each of 4 sites and 63 toads at another site in southwestern Westlock County in 1963 and 1965 (Cook 1983). The University of Alberta Museum of Zoology collected one toad from a site in northern Westlock County in 1934.

Thorhild:

1998-2007: The only records for this county over the past 10 years are observations made by Chuck Priestley in 2005 of one Canadian toad calling from each of two sites near Vinca Bridge (C. Priestley, pers. comm.).

Pre-1998: An AVAMPV observed 4 Canadian toads at a site in the southwestern region in 1997. The University of Alberta Museum of Zoology collected one Canadian toad in 1950 in Thorhild near the borders of Smokey Lake and Lamont Counties.

Athabasca:

1998-2007: One of the RANA sites occurs at the Meanook Biological Station (Wilkinson and Berg 2004). 102 western toads have been observed at this site between 1997 and 2006, but no Canadian toads have been observed (Wilkinson and Berg 2004). However, an AVAMPV reported a possible record of a calling Canadian toad approximately 8 km south of the town of Athabasca in 2000.

Pre-1998: An AVAMPV reported probable observations of a Canadian toad calling on three occasions in 1996 and one in 1997. However, there has not been a confirmed observation for this region since 1965 when the Canadian Museum of Nature collected five toads from a site near Athabasca and 36 toads from a site near Perryvale (Cook 1983).

Saddle Hills: Canadian toads have not been reported from this region.

Grand Prairie:

1998-2007: Saskatoon Island Provincial Park contains one of the RANA sites. Two additional sites were surveyed for amphibians in 2004 (Wilkinson and Berg 2004). Canadian toads have never been observed from this region.

Smoky River: Canadian toads have not been reported from this region.

Fairview: Canadian toads have not been reported from this region.

Birch Hills: Canadian toads have not been reported from this region.

Peace: Canadian toads have not been reported from this region.

Spirit River: Canadian toads have not been reported from this region.

Big Lakes:

Pre-1998: The only records for this region are from 1961; one Canadian toad was collected from each of two locations by the University of Saskatchewan Museum of Zoology (Biology).

Sunrise: Canadian toads have not been reported from this region.

Mackenzie:

Pre-1998: Records from two locations exist for this region, both along Riviere de la Paix. An AVAMPV observed one female in 1993 and Lisa Takats Priestley observed one YOY in 1993 from a site west of Fort Vermilion. The Canadian Museum of Nature collected nine individuals at Mikkwa River (east of Fort Vermilion) in 1968 (Cook 1983).

Opportunity:

1998-2007: Golder Associates Ltd. conducted two sets of amphibian surveys at 80 ponds in the Wabasca area in 2007. No toads were found during these surveys (C. Stevens, pers. comm.). However, an AVAMPV observed one adult Canadian toad in northeastern Opportunity in 2001.

Pre-1998: Two older records exist from the southern part of this county. An AVAMPV reported a probable observation of a calling toad in 1996. The University of Alberta Museum of Zoology collected one individual in 1962.

Wood Buffalo National Park:

1998-2007: An AVAMPV observed approximately 100 young toads in August 2001.

Eaton et al. (2005) examined the life-history variation among populations of Canadian toads in Alberta. One of their nine study locations was located in Wood Buffalo National Park (WBNP). They estimated the age and growth rates of 237 Canadian toads in the province, 5 of these toads were from WBNP. These samples were collected from 2 June 1999 to 18 July 1999.

Pre-1998: An AVAMPV observed one Canadian toad along the northern border of Alberta in 1996.

Municipality of Wood Buffalo:

1998-2007: 240 observations of approximately 929 Canadian toads (visual and auditory observations of all age classes) have been observed from this region over the past 10 years.

In addition to these observations, Golder Associates Ltd. surveyed 20 regions within this county between 2002-2007 and found Canadian toads in 10 of these areas, whereas western toads were only found in 3 areas. Within these 20 regions, 64 Canadian toads and 73 western toads were heard calling.

Pre-1998: Observations from 41 locations of about 106 toads have been reported from the Fort McMurray region between 1955 and 1998. Many of these have samples stored at the University of Alberta Museum of Zoology. The University of Alberta Museum of Zoology also collected one Canadian toad in 1971 near the Saskatchewan border and Lake Athabasca. And the Royal Ontario Museum collected one individual in 1945 along the Athabasca River approximately 75 miles downstream of Waterway.

In addition to these points, Roberts and Lewin (1979) conducted standardized amphibian surveys at 25 sites in 1976-1977. They surveyed each site at least eight times from June to August and found Canadian toads present at 9 of the 25 sites and spawning at 7 of these. 337 Canadian toads were observed during this study.

Collister and Kansas (1997 in Hamilton et al. 1998) reported that Canadian toads occurred at over one-third of sites surveyed near Kearn Lake (~65 km north of Fort McMurray).

Eaton et al. (2005) examined the life-history variation among populations of Canadian toads in Alberta. One of their nine study locations was located in the Fort

McMurray area. They estimated the age and growth rates of 237 Canadian toads in the province, 13 of these toads were from the Fort McMurray area. The University of Alberta Museum of Zoology collected these samples from 14 June 1976 to 8 June 1980.

Smoky Lake:

1998-2007: Lisa Matthias conducted surveys for Canadian toads at three locations in this county on 16 May 2005. No toads were heard at two of the locations and at the other location there was a call in the distance that may have been a Canadian toad (L. Matthias, pers. comm.). No other observations exist for Canadian toads in this region, but survey effort has been particularly low (Figure 2).

St. Paul:

1998-2007: Lisa Matthias conducted surveys for Canadian toads at six locations in St. Paul County on 16 May 2005; no Canadian toads were heard. However, an AVAMPV observed one Canadian toad approximately 8 km south of St. Paul in 1998.

Pre-1998: AVAMP volunteers reported probable observations of a Canadian toad calling at a site in the northern region of this county and south of St. Paul in 1996. The University of Alberta collected one Canadian toad in 1968. The Canadian Museum of Nature collected 31 Canadian toads from 4 locations between 1962 and 1965: 1 in 1962, and 1, 2, and 27 toads from the other three sites in 1965 (Cook 1983)

Lakeland:

1998-2007: Canadian toads appear to be widespread and fairly common in Lakeland County, but are still sometimes difficult to find. I conducted amphibian surveys (call or visual) at 49 sites north of Lac La Biche in 2005. Three Canadian toads were observed at two of these sites (one yearling and two adults) over 94 surveys conducted between 9 May and 11 June 2005. In comparison, western toads were observed at 7 of these sites.

Golder Associates Ltd. surveyed two regions in eastern Lakeland County in 2005 and 2006 for toads and found Canadian toads in one region and western toads in both. In one region 39 Canadian toads were heard calling and 39 western toads were also heard calling. In the other region, western toads were only found at one site.

In addition to these surveys, 19 Canadian toads have been observed from 13 sites over the past 10 years. Rick Lauzon heard toads calling in 1999 in eastern Lakeland County. In northern Lakeland County, an AVAMPV likely heard 4 Canadian toads calling in 1998.

Near Lac La Biche, five observations have been made. An AVAMPV observed one Canadian toad on 25 August 1998 south of the lake. North of the lake, another AVAMPV surveyed three locations and heard toads calling at one site and observed one at another site in 2000, and heard 2 toads calling at the third in 2005. Juanita Constible heard Canadian toads calling at one site north of the lake in 1998.

In southeastern Lakeland County, an AVAMPV observed 2 Canadian toads in 2002. An AVAMPV saw 2 Canadian toads in 2001. An AVAMPV surveyed three sites in southeastern Lakeland County in 2000, and heard Canadian toads calling from two sites and may have heard a toad calling from the other site. Another AVAMPV also may have heard Canadian toads calling in 1998.

Pre-1998: 48 observations (from 25 locations) of 112 individual toads have been reported for this county pre-1998. Most of these records were reported in the 1990's; however, records date as far back as 1949. Many of these records are confirmed observations made by amphibian researchers (Brian Eaton, Juanita Constible, or Pat Garcia; n = 23) or the University of Alberta Museum of Zoology (n = 8), Royal Ontario Museum (n = 1), and Royal Alberta Museum (n = 1).

Eaton et al. (1999) monitored amphibian populations using drift fence and pitfall traps at two lakes approximately 32 km northeast of the town of Lac La Biche from 1995-1997. They reported trapping Canadian toads at a rate of 6 to 41 individuals per year at these two lakes during this period.

Garcia et al. (2004) conducted surveys at 34 sites in 1996-1997 and observed Canadian toads at 18 sites (53 %). They conducted extensive monitoring efforts at one site (Skookum Lake) and captured 111 adults/juveniles and 319 metamorphs in pitfall traps (1998 trap days) plus 46 incidental adult/juvenile captures in 1996 and 28 adults/juveniles in pitfall traps (2158 trap days) plus 19 incidental adult/juvenile captures in 1997. They also radio-tracked 29 Canadian toads (for at least one week) between 1996 and 1997 in this area. Garcia et al. (2004) describe hibernation sites for three individuals; however, these toads were not tracked past 4 September so it's difficult to say whether these toads remained in these sites or moved to another location. Western toads radio-tracked in this same region began using underground shelters more frequently in late August and September but often changed locations through September and into October (pers. obs.).

Eaton et al. (2005) examined the life-history variation among populations of Canadian toads in Alberta. Four of their nine study locations were located in Lakeland County, three north of Lac La Biche and the other in Lac La Biche, at Sir Winston Churchill Provincial Park (SWCPP). They estimated the age and growth rates of 237 Canadian toads in the province, 98 of these toads were from these sites. The samples from SWCPP were collected by the University of Alberta Museum of Zoology from 7 May to 7 July, 1965. The samples from the three sites north of Lac La Biche were collected by Eaton et al. (2005) between 9 June 1996 and 10 August 2000.

Bonnyville:

1998-2007: Golder Associates Ltd. conducted two sets of amphibian surveys at 80 ponds in the Cold Lake area in 2007. Canadian toads were found at 1-2 sites and western toads were found at about a dozen sites (C. Stevens, pers. comm.).

Most of the recent observations for Canadian toads in Bonnyville County are in the northeastern corner (13 locations), except for one probable observation of Canadian toads calling in 1998 made by an AVAMPV. One Canadian toad was heard calling at a site 26 km northwest of Cold Lake in 2005. An AVAMPV observed one juvenile on 5 July and 5 Aug. 2005, 11 km west of Cold Lake. A consultant reported Canadian toads from 10 sites in 2001. They heard multiple toads calling from 2-4 June at a site 8 km northwest of Cold Lake and 1-2 toads calling from each of 9 sites 20-34 km northwest of Cold Lake on 11 June 2001. An AVAMPV observed one Canadian toad 25 km west of Cold Lake on 9 April 1999 (note: this date seems a bit early for toads to be out).

Pre-1998: Observations have been reported from 7 locations pre-1998. The University of Alberta Museum of Zoology collected one individual from the central region of the county in 1976, and three and one individuals from two sites near Cold Lake in 1954 and 1979, respectively. Wayne Smith reported three individuals calling from a site near Cold Lake and a probable observation of 10 individuals calling from another site, both in 1976. The Canadian Museum of Nature collected one individual from each of two sites in the central region in 1962.

Foothills Natural Region:

Clearwater:

Pre-1998: Western toads are common in this area, but Canadian toads have not been observed in the past 10 years. A consultant reported a probable observation of 4 Canadian toads calling in 1997 in northeastern Clearwater. An AVAMPV observed one adult Canadian toad at a breeding site in 1997 approximately 22 km south of Rocky Mountain House. Another AVAMPV reported a probable observation of a Canadian toad calling from a location in western Clearwater County in 1995. The Canadian Museum of Nature has one Canadian toad specimen collected approximately 19 km southeast from Rocky Mountain House in 1963.

Bighorn: Canadian toads have not been recorded from this area.

Yellowhead:

1998-2007: One of the RANA sites occurs in Hinton and traps were run between 2000 and 2006. In addition, 69 sites were surveyed in 2004 (Wilkinson and Berg 2004). Western toads are common at these sites, but no Canadian toads were ever observed (Wilkinson and Berg 2004). A consultant conducted an amphibian survey at an area north of Hinton in 2006, but also did not see any toads (A. Ashenhurst, pers. comm.).

An AVAMPV heard three Canadian toads calling at a site west of Hinton in 2002. Another AVAMPV observed one Canadian toad in 2002 in eastern Yellowhead County.

Pre-1998: An AVAMPV observed 3 adult Canadian toads in 1997 on the eastern border of this county (adjacent to Parkland County). The University of Alberta Museum of Zoology collected 4 adult Canadian toads in the central part of Yellowhead County in 1976.

Brazeau:

1998-2007: Cam Stevens surveyed many locations in this county for amphibians for his Ph.D. research (C. Stevens, pers. comm.). Canadian toads have never been reported from this area.

Clear Hills: Canadian toads have not been reported from this region.

Northern Lights: Canadian toads have not been reported from this region.

Greenview:

Pre-1998: A consultant observed 10 toad tadpoles at a site in southeastern Greenview County in 1997. This is the only Canadian toad record for this county. This record is considered suspect since Canadian toad tadpoles are extremely difficult to distinguish from western toad tadpoles.

Rocky Mountain Natural Region:

Waterton Lakes National Park: Canadian toads have not been recorded from this area.

Kananaskis:

1998-2007: One of the RANA sites is located in Kananaskis Country and has been run from 1998 to 2006. 43 sites were surveyed in 2004 (Wilkinson and Berg 2004). Canadian toads have never been observed from this area.

Pincher Creek: Canadian toads have never been observed in Pincher Creek (C. Smith, pers. comm.).

Ranchland: Canadian toads have not been recorded from this area.

Banff National Park: Canadian toads have not been recorded from this area.

Jasper National Park:

1998-2007: 146 sites were surveyed in 2004 as part of the RANA project (Wilkinson and Berg 2004). Canadian toads have never been reported from this area.

RECOMMENDATIONS

Much work is needed if we are to determine the threats to this species and to develop management plans to prevent further declines. Research examining the causes of decline, essential habitat requirements, and aspects of biology would be particularly useful places to start. More research is also needed to obtain better estimates on the rate of decline for Canadian toads in Alberta.

Our ability to detect/understand the distribution and population trends of the Canadian toad is limited by the quality of the data available. The data quality could be improved in a number of ways, including the following:

- 1) Encouraging the submission of zero data. Zero data are data points where people have searched for Canadian toads but not found any. One of the major problems in determining the current distribution of the Canadian toad is that we do not know whether the dearth of Canadian toad observations in some areas is due to population declines or to the absence of observers. Submitting data on all surveys conducted for Canadian toads (regardless of whether amphibians were observed or not) would greatly help determine which areas are under-surveyed and which areas may have experienced population declines.
- 2) Encouraging the submission of data on common species. Many people do not submit data of observations of common species (e.g., wood frog, chorus frog); however, these data can be very useful. Reporting data on species that are common now may be very important in the future if these species begin to decline. One of the major hurdles in determining whether Canadian toads have declined is that we do not have good records of historical population sizes. In addition to the potential future use of this data for conservation work with these species, data on other amphibian species could also benefit Canadian toad research by providing information on where people have searched for amphibians but not found Canadian toads and also may be useful for determining relationships between amphibian occurrence and land use or habitat requirements.
- 3) Accommodating/encouraging the submission of photographic records for the provincial database. This would be a very valuable addition to help researchers sort confirmed and possible observations.
- 4) Conducting standardized amphibian surveys to better understand/detect trends. Standardized amphibian surveys across the province are needed to better understand the current distribution and population trends of the Canadian toad. Revisiting historical sites of Canadian toads to determine if they are still present or have declined/disappeared would be particularly useful.

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